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ELEVATIONS OF COMPLEX PARTIAL EPILEPTIC-LIKE EXPERIENCES DURING INCREASED GEOMAGNETIC ACTIVITY FOR WOMEN REPORTING "PREMENSTRUAL SYNDROME"[1]

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Summary.—Responses to the frequency of complex partial epileptic-like experiences were recorded every second day by 12 women for at least two months per individual. Five (41%) of the women displayed significant increases (effect sizes between 6% and 17%) in the numbers of these experiences when the daily geomagnetic activity exceeded 40 nT. The results were consistent with the hypothesis that a spectrum of experiences and behaviours, associated with limbic lability, can be enhanced by environmental stimuli correlated with perturbations of the geomagnetic field.

Increases in the numbers of overt seizures as well as the subclinical correlates of limbic lability such as vestibular experiences have been positively associated with increases in geomagnetic activity (Persinger & Richards, 1995). Experimentally generated magnetic fields, designed to stimulate the intensity and temporal structure of natural geomagnetic activity, also evoke increased overt seizures in the lissencephalic rat (Michon & Persinger, 1997). Subpopulations of mammals that display greater sensitivity (lower thresholds) to geomagnetic activity may be more responsive to these perturbations.

Many of the subjective experiences reported by women who display the premenstrual syndrome are concordant, superficially at least, with limbic lability (Persinger & Makarec, 1991). Because introspective responsiveness ("awareness") of experiences have occurred when the proportion of limbic neurons exhibiting synchronized firing doubled from about 7% to 14% (Babb, Wilson, & Isokawa-Akesson, 1987), we reasoned that individuals who display "Premenstrual Syndrome" may be more prone to experience and to report limbic symptoms when ambient stimuli encouraged this quantitative integration within neuronal populations. This study was designed to discern whether the numbers of experiences associated with limbic sensitivity for women who reported Premenstrual Syndrome were positively and significantly correlated with global geomagnetic activity.

The data for 12 women, ages 21 to 45 years ($M=35$ yr.) who had volunteered for a study concerning perimenstrual symptoms, were extracted from the first author's data base. These subjects had been asked to complete

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a modified version of Roberts, Varney, Hulbert, Paulsen, Richardson, Springer, Shepard, Swan, Legrand, Harvey, and Stuchen (1990) questionnaire for the Epileptic Spectrum Disorder or complex partial epileptic-like experiences profile. The primary difference from the original scale was that the person ranked the incidence of each of the same 36 symptoms and signs for the previous and present days on a scale of 0 to 4 points (not once, once, twice, three times, >3 times). Each subject was instructed to complete this questionnaire during the late evening every second day for at least two months (all *df*s = 1, 43 through 68). The data were collected over a 6-mo. period. The total scores for each recording were employed. The mean and *SD* for the daily aa (average antipodal) values for the northern hemisphere for this period were 25.3 nT and 16.7 nT, respectively.

To discern if a threshold existed for the elevation of complex partial epileptic-like experiences, one-way analysis of variance was conducted for days that were below or above 30 nT, 40 nT, or 50 nT for each subject. Nonparametric correlations were also completed between these inferences of limbic lability and the daily measures as well as the proportion of the difference between the daily aa value and the value for the previous day divided by the value for the previous day. All analyses involved SPSS software.

The results indicated that two of the 12 women displayed statistically significant elevations ($p < .05$) and an additional three displayed elevations which fell short of statistical significance ($p < .10$) in their individual scores when the data were analyzed for days when aa values exceeded 40 nT but not if the dichotomy involved greater or less than 30 nT. For these five subjects, the means and standard deviations for the total scores for the days on which the aa values were less than 40 were 6.6 and 4.7, 5.4 and 7.4, 3.1 and 3.9, 1.9 and 1.5, 7.3 and 5.4, respectively while these values for days on which the values were 40 or greater were 11.0 and 5.4, 7.4 and 4.2, 5.6 and 2.6, 5.0 and 5.6, and 11.1 and 5.0, respectively. There was no statistically significant difference ($F_{1,10} = 1.20$, $p > .05$) between the means for the average incidence of symptoms for the five women whose values ($M = 5.4$, $SD = 2.5$) were significantly associated with geomagnetic activity relative to the seven women whose scores ($M = 9.8$, $SD = 8.9$) were not significantly associated with geomagnetic activity.

Nonparametric (Spearman *rho*) correlations between scores for complex partial epileptic-like experiences and aa values showed statistically significant, positive correlations (*rhos* = .25 and .29, $p < .01$) for two of these women. Four of the women showed significant positive correlations (*rhos* between .25 to .27, $p < .01$) between the ratio of the change in geomagnetic activity from the previous day and these experiences. The days with the largest relative elevation of the mean of the *z* scores for the limbic experiences for the five sensitive women (combined) displayed a statistically significant ele-

vation ($F_{1,111}=5.27$, $p<.05$) in the frequency of experiences if the relative increased geomagnetic activity from the previous day was equal to or greater than 50%, e.g., from 10 nT to >15 nT or 30 nT to >45 nT. Were these results generalizable, then a substantial subpopulation of individuals who experience premenstrual symptoms may also exhibit a sensitivity to geomagnetic activity-induced alterations in neurochemistry (such as disruption of nocturnal melatonin) that is sufficient to be perceived and to be reported the following day.

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